REMARKS

Reconsideration is respectfully requested.

DRAWINGS

Figs. 6 and 10 stand objected to.

As to Fig. 6, the reflected light 210a of Fig. 6 is contrary to the Examiner's impression that mirrors or reflectors flip the handedness of the reflected light. In response, the Applicants respectfully submit that the left-right reversal characteristic of a mirror relates to perception of a viewer perceiving the virtual image formed behind the mirror. The reflected light 210a of Fig. 6 does not relate to a virtual image formed behind a mirror or a reflector; rather, it is the reflected light that is proper under the Firmat's principle of reflection. Therefore, the Applicants respectfully submit that Fig. 6 is correct as drawn.

As to Fig. 10, the drawing has been corrected to label the horizontal axis with "μm" as suggested by the Examiner. Further, Fig. 10 illustrates an example of the present invention that is simulated at one particular wavelength, i.e., 570 nm, of the visible light spectrum, and Fig. 10 is not drawn to limit the present invention to be operational only at 570 nm. Accordingly, the Specification (page 14, lines 19-27) and Fig. 10 have been amended.

SPECIFICATION AND ABSTRACT

The title of the present application is objected to for being non-descriptive of the invention. The title has been corrected as suggested.

The Abstract is objected to for containing more than 150 words. The Abstract has been amended to contain 150 or fewer words.

CLAIMS

Claims 1-10 are pending in the present application. Claims 1-10 have been rejected. By the present amendment, Claims 1 and 7-10 have been amended to overcome the rejections. A marked-up copy of the amended and added claims is attached hereto. No new matter has been added.

REJECTION UNDER 35 U.S.C. §112

Claims 1-10 stand rejected under 35 U.S.C. §112, ¶2 as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as the invention.

As to Claims 1 and 7, the Office Action states that the claimed limitation "wherein retardation of the liquid crystal layer is $(2n+1)\lambda/4$" is unclear in two ways. First, Claims 1 and 7 recite that n is a positive number, but Fig. 10 seems to indicate that n can be zero or a positive number. Second, Claims 1 and 7 recite the retardation in terms of λ but does not specify the exact value of λ. The Examiner indicated that for the examination purposes, n was assumed to include zero and λ was assumed to be 550 nm as described in the Specification page 14 and Fig. 10.

In response, the Applicants respectfully submit that the Examiner has correctly stated that n includes zero, and the claims are amended accordingly. However, the Applicants respectfully submit that the Examiner is not correct in assuming that λ includes only one wavelength of the visible light spectrum. The 550nm wavelength of light set forth in the Specification was for purposes of illustration and is a nominal value. Other values of λ are possible. Rather, the λ recited in the claims of the present application includes all wavelengths of the visible light spectrum.

REJECTION UNDER 35 U.S.C. §103(a)

Claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,147,727 (Shigeno) in view of an official notice of a structural nature of a hypothetical device not shown in any of the related prior art. Claims 1-2 and 5-6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,341,001 (Kwok) in view of U.S. Patent No. 6,323,927 (Hiroshi) and further in view of an official notice of structure similar to that used in the rejection of Claim 1. Claims 3, 7 and 9-10 stand rejected as unpatentable further in view of yet another official notice.

The Rejection of the Independent Claims 1 and 7 is Improper

As to Claims 1 and 7, the conventional twisted nematic (TN) mode reflective liquid crystal display has chronic problems associated with poor viewing and a low contrast ratio (see description in the Specification page 1, lines 16-18). To solve these problems, the conventional reflective TN liquid crystal displays typically utilize an optical component (such as a $\lambda/4$ wavelength plate) to improve contrast

(Specification page 4, lines 19-22). However, the manufacturing cost of reflective TN liquid crystal displays increases by adding an optical component (such as the λ/4 wavelength plate). Moreover, the λ/4 wavelength plate itself fails to transmit all incident light but absorbs some of the incident light or the reflected light contributing to the deterioration of the transmissivity, i.e., the reflectance, of the TN liquid crystal displays (Specification page 4, lines 18-27).

The present invention solves, inter alia, the problems associated with an optical device (such as a λ/4 wavelength plate), which may be utilized in TN liquid crystal displays. That is, the present invention solves the problem by **not** utilizing an optical component (such as a λ/4 wavelength plate) in constructing reflective type liquid crystal displays. Instead, the liquid crystal layer (Specification page 10, lines 32-36; Fig. 5, element 65) of the liquid crystal display of the present invention is constructed to also serve the role of an optical component (such as a λ/4 wavelength plate), and this is achieved by adjusting the retardation characteristic of the liquid crystal layer (Specification page 10, lines 36; page 11, line 1). As illustrated with respect to Fig. 3 and described in the Specification on page 7, lines 17-20, the retardation of the liquid crystal layer is the product of the cell gap (Fig. 3, element d11) and the index of refraction anisotropy of the liquid crystal molecules (Fig. 3, element 65). By setting the retardation of the liquid crystal layer (Fig. 3, element 65) to $(2n+1)\lambda/4$, the reflective TN liquid crystal display of the present invention do not require the use of an optical component (such as a λ/4 wavelength plate) by virtue of which the problems associated with using such an optical component when constructing a reflective trans nematic liquid crystal display are eliminated.

The solution to these problems, as embodied in invention disclosed and claimed in the present application, is neither taught nor suggested in the Shigeno reference. In contrast, the Shigeno reference discloses a conventional TN liquid crystal display that utilizes a $\lambda/4$ wavelength plate as an optical component (Shigeno col. 5, lines 60-65; Fig. 4, element 80) to solve problems associated with the contrast (i.e., the ratio between the white display reflectivity and the black display reflectivity) of the display (Shigeno col. 2, lines 26-42). The Shigeno reference does not offer any solution to the problems associated with using the $\lambda/4$ wavelength plate affecting the increased manufacturing cost and the deteriorated transmissivity.

Shigeno fails to teach or suggest a reflective liquid crystal display that does not utilize an optical component (such as a $\lambda/4$ wavelength plate). That is, Shigeno fails to teach or suggest, inter alia, the claimed element of a liquid crystal layer having a retardation value of $(2n+1)\lambda/4$ when the liquid crystal molecules in the liquid crystal layer are driven by the fringe field. The λ is the wavelength of light and n is zero or a positive number, as amended.

Because Shigeno fails to teach or suggest all claim limitations of the present application, the prima facie case of obviousness has not been established. The seminal case of Graham v. Deere states the test for obviousness, as has been recognized by countless decisions.

> "The legal determination under section 103 is whether the claimed invention as a whole would have been obvious to a person of ordinary skill in the art at the time the invenitonwas made. *In re. O'Farrell*, 85f3 F.2d 894, 902 7 USPQ2d 1673, 1680 (Fed. Cir. 1988). The foundational facts for the prima facie case of obviousness are: (1) the scope and content of the prior art; (2) the difference between the prior art and the claimed invention; and (3) the level of ordinary skill in the art. *Graham v. John Deere Co.*, 383 U.S. at 17-18; *Miles Lab., Inc. v. Sahndon Inc*, 997 F.2d 870, 877 27 USPQ2d 1123, 1128 (Fed. Cir. 1993)." In re Mayne, 104 F.3d 1339, 41 USPQ2d 1451, 1453, (Fed. Cir. 1997).

The test for setting forth a *prima facie* case of obviousness is also well established in patent law.

> "The Patent and Trademark Office (PTO) has the burden of showing a *prima facie* case of obviousness. *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1530 (Fed. Cir. 1993) see *In re Fine*, 837 F.2d 1071, 1074 5 USPQ2d 1596, 1598 (Fed. Cir. 1988)." Id.

Also according to MPEP, it is well established that the Office bears the initial burden of factually supporting any prima facie conclusion of obviousness. MPEP § 2142. One of many requirements for establishing prima facie obviousness is that the prior art references must teach or suggest all claim limitations. MPEP § 2143. Further, the rejection is required to show in the references themselves that there is some suggestion or motivation to modify references or to combine reference teachings. Id. The mere fact that the teaching of the prior art can be modified or combined does not establish a motivation or suggestion to combine and make the resultant combination prima facie obvious. Id. The prior art must suggest the desirability of the combination. MPEP §2143.01.

The Shigeno reference fails to provide any incentive for modification of the reference in respect of the rejection of Claim 1, since the object of the present invention is to solve the prior art problems associated with utilizing an optical component in constructing a reflective TN liquid crystal display (i.e., increased manufacturing cost, deteriorated transmissivity, etc.). No such solution is found in the Shigeno reference. Shigeno teaches the use of the $\lambda/4$ wavelength plate as shown in Fig. 4; thus, Shigeno cannot solve the same prior art problems that are solved by the present invention.

Moreover, neither the Kowk reference nor the Hiroshi reference teaches or suggests the claimed invention. Claims 1 and 7, as amended, recite that retardation occurs in the liquid crystal layer by $(2n+1)\lambda/4$ when the liquid crystal molecules in the liquid crystal layers are driven by the fringe field. The support for this limitation is found in the Specification page 12, lines 2-9 and Fig. 6. More specifically, the liquid crystal molecules that are not driven by the fringe field (as shown in Fig. 5, element 65a) allow the incident light and the reflected light to pass through the liquid crystal layer (Fig. 5, element 65) causing a white state screen. In contrast, the liquid crystal molecules that are driven by the fringe field (as shown in Fig. 6, element 65a) are arranged so that the fringe field and the long axis or the optical axis of the molecules are parallel, causing the retardation to occur in the liquid crystal layer by $(2n+1)\lambda/4$. Upon passing through the liquid crystal layer of retardation value of $(2n+1)\lambda/4$, the linearly polarized incident light (Fig. 6, element 200b) turns into a circularly polarized incident light (Specification page 12, lines 10-20; Fig. 6, element 200c). The result is that the reflected light that had passed through the liquid crystal layer (Fig. 6, element 210b) is polarized orthogonal to the polarizing axis (Fig. 6, element 70a) and causing a "dark state" screen.

Additionally, the Applicants respectfully submit that taking official notice of a feature claimed as part of the invention creates difficulties in responding to the rejections. As stated in MPEP §2144.03:

> "[A]ssertions of technical facts in areas of esoteric technology must always be supported by citation of some reference work" and "allegations concerning specific 'knowledge' of the prior art, which might be peculiar to a particular art should also be supported." Furthermore the applicant must be given the opportunity to challenge the correctness of such assertions and allegations. "The facts so noticed serve to 'fill the gaps' which might exist in the evidentiary showing" and should not comprise the principle evidence upon which a rejection is based. For example, see *In re Ahlert*, 424 F.2d 1088, 1091, 165 USPQ 418, 420-421 (CCPA 1970)."

This claimed invention, inter alia, is neither taught in nor suggested by the Kwok or Hiroshi references. The Kwok reference relates to various modes of reflective LCD (primarily TN-ECB) that takes advantage of birefringent characteristics of the twisted nematic liquid crystals but is silent on driving the liquid crystal molecules to realize retardation of $(2n+1)\lambda/4$. On the other hand, the Hiroshi reference relates to utilization of the "in-plane switching" in the liquid crystal displays, but does not disclose anything about affecting (via fringe fields) the retardation value of the liquid crystal layer. As understood, the Hiroshi reference requires the use of additional optical component such as "a retardation film" to "compensate for the contrast ratio of the liquid crystal display" (Hiroshi col. 5, lines 24-28). This is substantially different from the present invention that overcomes the chronic problems of transmematic liquid crystal displays (e.g., poor viewing angle, low contrast ratio, etc.) without requiring an additional optical component. Thus, neither the Kwok reference nor the Hiroshi reference, alone or in combination, teaches or suggests the present invention.

Moreover, the rejection again relies upon "taking official notice" of facts as supporting evidence of obviousness, and the statements made above also relates to this rejection. It is further respectfully suggested that the finding of obviousness is conclusory and is not considered to properly state the grounds of the rejection or the reason why the proposed combination is obvious from the disclosure found in the references or any other supporting evidence. This type of conclusory rejection has been found to be an improper assertion of a "conclusion, not a reason" (In re Garrett decided on September 30, 1986; for a synopsis of In re Garrett, see the enclosed copy of BNA PTC Journal, vol. 33, page 43).

Accordingly, the rejection of Claims 1 and 7 is considered to be improper.

The Rejection of Dependent Claims is Improper

As to dependent Claims 2-6 and 7-10, the Applicants respectfully submit that these claims are allowable at least since they are dependent on one of the independent Claims 1 and 7 that are considered to be allowable.

Conclusion

For the reasons set forth above, the Applicants respectfully submit that the Claims 1-10, now pending in the present application, are in condition for allowance over the art of record. This amendment is considered to be responsive to all points raised in the Office Action. Accordingly, the Applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicits an indication of allowable subject matter. Should the Examiner have any remaining questions or concerns, the Examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

Dated: August 22, 2002

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DOCKET: CU-2258

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Seung Ho HONG et al.	]
Serial No:	09/607,014	] GRP ART UNIT: 2871
Filed:	June 29, 2000	] Ex.: Andrew M. SCHECHTER
For:	REFLECTIVE TYPE-FRINGE FIELD SWITCHING MODE LCD	]

SPECIFICATION-MARKED UP VERSION

Please replace the first paragraph (i.e., lines 19-27) of page 14 in the Specification with the following paragraph set forth below:

"FIG. 10 of accompanying drawings is a graph showing reflectance in accordance with [retardation(dΔ n)] retardation (dΔn) in a reflective type FFS-LCD according to this invention. According to FIG. 8, for example when λ is [550nm] 570 nm, the points which reflectance are 0 and 0.9 show periodically. At this time, at the point of 0 retardation is (2n+1)λ/4 and at the point of 0.9 retardation is 2n/λ. Consequently, when retardation of the liquid crystal layer 65 is (2n+1)/λ, a display can be realized without the λ/4 plate."

DOCKET: CU-2258 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Seung Ho HONG et al.	]
Serial No:	09/607,014	] GRP ART UNIT: 2871
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For:	REFLECTIVE TYPE-FRINGE FIELD SWITCHING MODE LCD	]

CLAIMS-MARKED UP VERSION

Claims 1-10 are currently pending in the present application.

Please amend Claims 1 and 7-10 as set forth below.

1. (Once Amended) A reflective type fringe field switching mode liquid crystal display ("a reflective FFS-LCD") comprising:

a liquid crystal layer having a plurality of the liquid crystal molecules;

a first substrate disposed on one side of the liquid crystal layer and [in which] a counter electrode and a pixel electrode <u>formed on the first substrate</u> [, both] for generating a fringe field to drive the liquid crystal molecules [are formed];

a second substrate disposed on the other side of the liquid crystal layer;

a first homogeneous alignment layer interposed between the liquid crystal layer and the first substrate and having a rubbing axis in a selected direction;

a second homogeneous alignment layer interposed between the liquid crystal layer and the second substrate, and having a rubbing axis in a selected direction;

a polarizer disposed on an [out side] <u>outer surface</u> of one of the first substrate and the second substrate, and having a selected polarizing axis; and

a reflective plate disposed on an [out side] outer surface of the other of the first substrate and the second substrate,

wherein retardation occurs in [of] the liquid crystal layer [is] by $(2n+1)\lambda/4$ [(here,] when the liquid crystal molecules in the liquid crystal layer are driven by the fringe field and wherein λ is [wave] the wavelength of light and n is zero or a positive number[])].

7. (Once Amended) A reflective FFS-LCD comprising:

a liquid crystal layer having a plurality of liquid crystal molecules;

a first substrate disposed on one side of the liquid crystal layer and [on which] a counter electrode and a pixel electrode formed on the first substrate [, both] for generating a fringe field to drive the liquid crystal molecules [are formed];

a second substrate disposed on the other side of the liquid crystal layer;

a first homogeneous alignment layer interposed between the liquid crystal layer and the first substrate and having a rubbing axis in a selected direction;

a second homogeneous alignment layer interposed between the liquid crystal axis in a selcected direction anti-parallel to the rubbing axis of the first homogeneous alignment layer;

a polarizer disposed on an [out side] outer surface of one of the first substrate and the second substrate, and having a selected polarizing axis; and

a reflective plate disposed on an [out side] outer surface of the other substrate of the first substrate and the second substrate,

wherein the rubbing axes of the first and the second alignment layers are at an angle of 10 to 85° with a substrate projection line of the fringe field,

wherein retardation occurs in [of] the liquid crystal layer [is] by $(2n+1)\lambda/4$ [(here,] when the liquid crystal molecules in the liquid

crystal layer are driven by the fringe field and wherein λ is [wave] the wavelength of light and n is zero or a positive number[])].

8. (Once Amended) The reflective type FFS-LCD according to claim [1] 7, wherein the rubbing axes of the first and the second alignment layers and a polarizing axis of the polarizer coincide.

9. (Once Amended) The reflective type FFS-LCD according to claim [1] 7, wherein the rubbing axes of the first and the second alignment layers and the polarizing axis of the polarizer are at an angle of 20 to 60°.

10. (Once Amended) The reflective type FFS-LCD according to claim [5] 9, wherein the rubbing axes of the first and the second alignment layers and the polarizing axis of the polarizer are at an angle of 45°.